

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
4 March 2004 (04.03.2004)

PCT

(10) International Publication Number  
**WO 2004/019083 A3**

(51) International Patent Classification<sup>7</sup>: **G02B 5/18**,  
6/12, 6/34

(21) International Application Number:  
PCT/CA2003/001300

(22) International Filing Date: 26 August 2003 (26.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/405,730 26 August 2002 (26.08.2002) US

(71) Applicant (for all designated States except US): **VALOR-BEC SOCIETE EN COMANDITE** [CA/CA]; 550 rue Sherbrooke Ouest, Suite 100, Montreal, Quebec H3A 1B9 (CA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **BALAKRISHNAN**,

Ashok [CA/CA]; 67 Tiffany Place, Kanata, Ontario K2K 1W5 (CA). **DOSSOU, Kokou** [CA/CA]; 396 Carmen St., Apt. 7, Ottawa, Ontario K1L 6Y2 (CA). **PACKIRISAMY, Muthukumaran** [CA/CA]; 570 rue Avila-Legault, Dorval, Quebec H9P 2X4 (CA).

(74) Agents: **BRETT, Allan et al.**; Smart & Biggar, P.O. Box 2999, Station D, 900-55 Metcalfe Street, Ottawa, Ontario K1P 5Y6 (CA).

(81) Designated States (*national*): CA, US.

(84) Designated States (*regional*): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

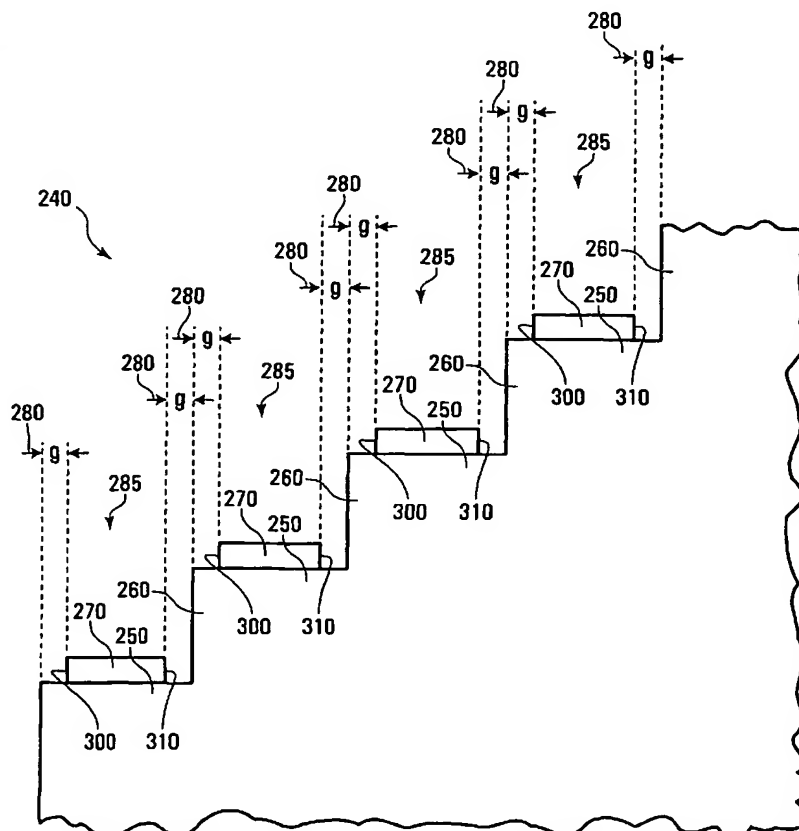
Published:

— with international search report

(88) Date of publication of the international search report:  
23 September 2004

[Continued on next page]

(54) Title: **PLANAR WAVEGUIDE GRATING DEVICES HAVING CONTROLLED POLARIZATION DEPENDENT SENSITIVITY AND METHOD OF MANUFACTURING THEREOF**



(57) Abstract: Diffraction gratings are formed from grooves each having a reflective facet and a non-reflective facet. The net reflection of TE (Transverse Electric) and TM (Transverse Magnetic) polarizations from the grating structure is traded off against the polarization dependent reflection, by controlling the degree of metallization of the reflective facet and by ensuring that there is no metallization of non-reflective sidewalls. Other diffraction gratings are manufactured from trenches etched perpendicular to a waveguide. The trenches are metallized and back-filled with a filling material having a refractive index matched to that of the waveguide. The gratings essentially have no non-reflecting sidewalls with insignificant polarization influence from side walls.

**WO 2004/019083 A3**



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 03/01300

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G02B5/18 G02B6/12 G02B6/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 400 509 B1 (BACH BERNHARD W ET AL) 4 June 2002 (2002-06-04) cited in the application figure 3 column 5, lines 12-15	1-10
A	CHOWDHURY D: "Design of low-loss and polarization-insensitive reflection grating-based planar demultiplexers" IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS, vol. 6, no. 2, March 2000 (2000-03), - April 2000 (2000-04) pages 233-239, XP002264378 cited in the application figure 4	1-10

☐

Further documents are listed in the continuation of box C.

☒

Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the International filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

17 December 2003

Date of mailing of the international search report

07.06.2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Quertemont, E

## INTERNATIONAL SEARCH REPORT

### Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-10

#### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-10

Independent claims 1 and 6 describes a diffraction grating and manufacturing method thereof comprising a plurality of grooves formed in a substrate with each groove having  
-a reflective facet having at least one coated region coated with electrically conducting material and at least one uncoated region not coated with electrically conducting material;  
-at least one sidewall, the sidewall not coated with electrically conductive material  
---

2. claims: 11-38

Independent claims 11,18 and 38 relates to a diffraction grating, and manufacturing method thereof, comprising a plurality of grooves, each grooves having a reflective facet and effectively no sidewalls.  
---

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International Application No

PCT/CA 03/01300

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6400509	B1	04-06-2002	
		AU 5523601 A	23-10-2001
		CA 2406458 A1	18-10-2001
		CN 1439109 T	27-08-2003
		EP 1272882 A2	08-01-2003
		JP 2004510172 T	02-04-2004
		WO 0177738 A2	18-10-2001
		TW 487812 B	21-05-2002
-----			